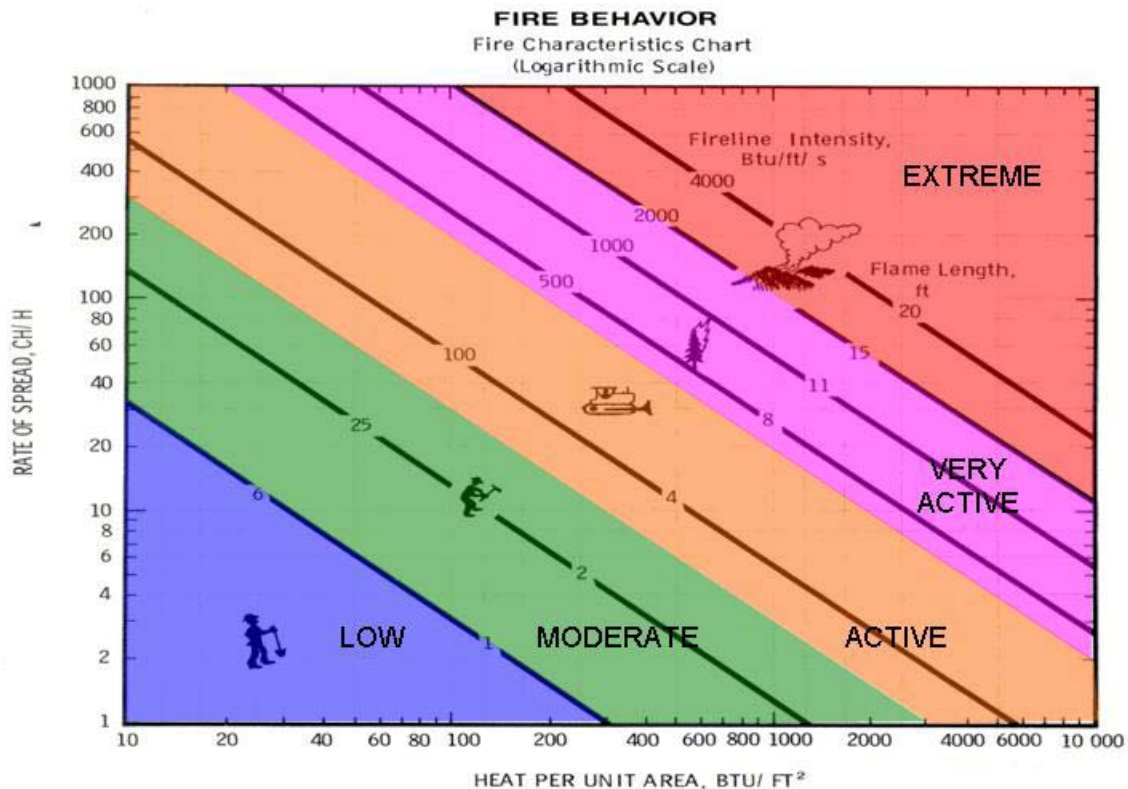


## ADJECTIVE RATINGS FOR FIRE BEHAVIOR

For many years now in America we have used the National Fire Danger Rating System (Deeming, et al, 1978) adjective ratings to describe the “fire danger” for a given parcel of wildland. These ratings of low, moderate, high, very high, and extreme carried some degree of descriptive advice of the “danger” of having an ignition based on historic weather data for what kind of fire to expect on any given day and place. Nowhere, however, was there any concrete description of what these ratings meant regarding potential fire behavior. Furthermore, they described “fire danger” which is clearly something different from describing fire behavior.

Fire behavior is described most simply in terms of fireline intensity (in feet of flame length) and in rate of spread (in chains per hour). The Fire Behavior Fire Characteristics Chart (fig. 1), or “Haul Chart” as firefighters call it (Andrews and Rothermel, 1982), plots fire behavior in terms of heat per unit area released (as BTU’s per square foot, as the X axis) versus rate of spread (as chains per hour, as the Y axis).

Figure 1. Fire Characteristics (Haul) Chart Including Adjective Ratings for Fire Behavior



The Haul Chart was so named because it infers the relative intensity of the fire behavior through graphical representations of firefighters working—haul firefighters, equipment working—haul equipment, trees torching—haul retardant, and crown fire—haul everybody to safety. Since fireline intensity and flame length are directly proportional (Byram, 1959)—the larger one gets the larger the other gets—and since we can visually assess the flame length the Haul Chart is an excellent tool for measuring the safety and effectiveness of various fireline resources.

The fireline interpretations of the Haul Chart are as follows:

Figure 2. Haul Chart Interpretations (from Fireline Handbook, Appendix B.)

| FLAME LENGTH (Feet) | FIRELINE INTENSITY (BTU/Ft/Sec) | INTERPRETATIONS   |
|---------------------|---------------------------------|---|
| 0-4                 | 0-100                           | Fires can generally be attacked at the head or flanks by persons using handtools. Handline should hold the fire   |
| 4-8                 | 100-500                         | Fires are too intense for direct attack on the head by persons using handtools. Handline can not be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective. |
| 8-11                | 500-1,000                       | Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.  |
| 11+                 | 1000+                           | Crowning, spotting, and major runs are common, control efforts at the head of the fire are ineffective.   |

When discussing relative fire behavior ratings as a Fire Behavior Analyst I have found that it makes most sense to relate the current and expected fire behavior to the Haul Chart and to the obvious implications to both efficiency and safety. I have found that the simplest terms to describe fire behavior are the adjective ratings of **LOW**, **MODERATE**, **ACTIVE**, **VERY ACTIVE**, and **EXTREME**. Over many years working both as an on-the-line FBAN and as a GACC FBAN I

have found it most important to be able to describe in simple terms the intensity of the fire behavior to be expected and then the obvious implications to firefighter effectiveness and safety. My adjective ratings use slightly different break points in the interest of firefighter safety. These are graphically represented in Figure 1 and are listed below in Figure 3.

Figure 3. Adjective Ratings for Fire Behavior

| ADJECTIVE RATING | FLAME LENGTH | IMPLICATION   |
|------------------|--------------|---|
| LOW              | 0-1          | Fire will burn and will spread however it presents very little resistance to control and direct attack with firefighters is possible  |
| MODERATE         | 1-3          | Fire spreads rapidly presenting moderate resistance to control but can be countered with direct attack by firefighters  |
| ACTIVE           | 3-7          | Fire spreads very rapidly presenting substantial resistance to control. Direct attack with firefighters must be supplemented with equipment and/or air support.                   |
| VERY ACTIVE      | 7-15         | Fire spreads very rapidly presenting extreme resistance to control. Indirect attack may be effective. Safety of firefighters in the area becomes a concern.                       |
| EXTREME          | >15          | Fire spreads very rapidly presenting extreme resistance to control. Any form of attack will probably not be effective. Safety of firefighters in the area is of critical concern. |

There are other systems for adjective rating of fire behavior that use the different fuel models and run various inputs through the BEHAVE software achieving widely variable outputs. These are certainly useful for site-specific projections and should be used in conjunction with the Haul Chart for specific wildland fires. I believe, however, that this simplified approach linking fireline intensity to firefighter effectiveness and safety is more appropriate for description of fire behavior potential over larger geographic areas.

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